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ABSTRACT

The major purpose of this study was to ascertain the reading and math progress made by Title I eligible intermediate grade students who lived and attended school in the Minneapolis Public Schools Target Area. A comparison group of students was also selected for study from a non-target school. The study population was all 1969-70 fourth graders whose test scores were at or below the 25th percentile on publisher norms of the Gates-MacGinitie Reading Comprehension Test. The Target group consisted of 126 students, and the non-Target group consisted of 154 students. In January 1970 and October 1971, both student groups took the same form of the Vocabulary and Comprehension Gates-MacGinitie Test, as well as the Modern Mathematics Supplement to the Iowa Tests of Basic Skills. Target Area students made grade equivalent gains on both the Vocabulary and Comprehension Tests, which was below the expected gain of 1.6 suggested by the publisher's norms. The non-Target students made gains of 1.1 in vocabulary and 1.5 in comprehension. Thirty percent of the Target students made gains of 1.6 or better in vocabulary and 33% made or exceeded 1.6 in comprehension. In math, the Target group had a pretest grade equivalent score of 3.0 and a posttest score of 4.4. The non-Target group went from 3.0 to 4.8. Results of comparing the posttest scores of the Title I Target students with a similar group of educationally disadvantaged non-Target students showed that both groups performed about the same in reading comprehension, but the non-Target group performed somewhat better in vocabulary and math. (DB)

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Minneapolis Public Schools

AN ANALYSIS OF THE READING AND MATH GROWTH OF MINNEAPOLIS INTERMEDIATE GRADE TITLE I STUDENTS 1969-1971

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Ideas expressed in this report do not necessarily reflect the official position of the Minneapolis Public School Administration nor the Minneapolis School Board

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Minneapolis Public Schools

AN ANALYSIS OF THE READING AND MATH GROWTH OF MINNEAPOLIS INTERMEDIATE GRADE TITLE I STUDENTS 1969-1971

Summary

The major purpose of this study was to ascertain the reading and math progress made by Title I eligible intermediate grade students who resided and attended school in the Minneapolis Public Schools' Target Area. A comparison group of students was also selected for study from the non-Target schools. See page 1

The population from which the Target and non-Target student groups were selected consisted of all 1969-70 fourth graders in the Minneapolis Public Schools whose test scores were at or below the 25th percentile on publisher norms of the Gates-MacGinitie Reading Comprehension Test. The Target study group, which was randomly selected, consisted of 126 students or 26 percent of the eligible Title I fourth graders. The non-Target group, also randomly selected, consisted of 154 students or 66 percent of the non-Target population. See page 3

In January 1970 and October 1971, both Target and non-Target student groups took the same form of the Vocabulary and Comprehension Gates-MacGinitie Test. At the time, both groups took the Modern Mathematics Supplement to the Iowa Tests of Basic Skills. The tests are part of the citywide testing program used in all elementary schools. See page 7

Target Area students made grade equivalent gains on both the Vocabulary and Comprehension Tests which was somewhat below the expected gain of 1.6 suggested by the publisher's norms. The non-Target students made gains of 1.1 in vocabulary and 1.5 in comprehension while the typical Minneapolis students made expected gains (1.6). Thirty percent of the Target students made gains of 1.6 or better in vocabulary and 33 percent made or exceeded 1.6 in comprehension. See pages 12-20

In math, the Target group had a pretest grade equivalent score of 3.0, and on the posttest, 4.4. The non-Target group went from 3.0 to 4.8. An average Minneapolis student had a grade equivalent score of 3.5 on the pretest and 5.6 on the posttest. Because the pretest and posttest were different levels and forms, caution should be used when interpreting the results of any gains made by the student groups. See pages 12-20

Another concern of this study was how Title I eligible Target students compared with a similar group of educationally disadvantaged non-Target students on the posttest scores. In analyzing posttest scores, the pretest score, verbal and non-verbal I.Q., and the students' mobility index were statistically controlled by analysis of covariance for regression. The results indicated that the non-Target group performed somewhat better in vocabulary and math and about the same in reading comprehension.

See pages 12-20

This study confirms earlier indications which led to a refinement of Title I reading and math programs at the intermediate and junior high school levels for the 1972-73 school year. It also confirms the need for greater emphasis on earlier intervention in reading and math at the primary level.

See pages 24-25

* * *

August 1972

Research and Evaluation Department

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Table of Contents

	Page
Summary	ii
Acknowledgements	iv
Listing of Tables	vi
Overview	1
Objectives	3
Population and Sampling Procedures	3
Achievement Tests and Other Measurements	7
Methodology	8
Analysis of the Data	12
Pre- and Posttest Vocabulary Score Comparison for the Target and Non-Target Student Groups	12
Pre- and Posttest Reading Comprehension Score Comparison for the Target and Non-Target Student Student Groups	13
Pre- and Posttest Mathematics Score Comparison for the Target and Non-Target Student Groups	15
Sixth Grade Achievement Test Score Comparison Between Target and Non-Target Students	16
Target Area Student Grade Equivalent Gains in Vocabulary and Comprehension by Category	20
Summary and Discussion	21
References	28

Listing of Tables

Table		Page
1	Sample Breakdown for Target Area Student Group by School.	4
2	Sample Breakdown for Non-Target Area Fourth Grade Student Group by School	6
3	Breakdown of Target and Non-Target Student Sample by Number of Male and Female Students.	7
4	Mean Raw Scores, Raw Score Standard Deviation, Grade Equivalents, Publisher Percentiles and Gains for Target and Non-Target Students on January 1970 Pretest and October 1971 Posttest Gates-MacGinitie Vocabulary Test	13
5	Mean Raw Scores, Raw Score Standard Deviation, Grade Equivalents, Publisher Percentiles and Gains for Target and Non-Target Students on January 1970 Pretest and October 1971 Posttest Gates-MacGinitie Comprehension Test.	14
6	Mean Raw Scores, Raw Score Standard Deviation, Grade Equivalents, and Publisher Percentiles, for Non-Target Students on January 1970 Pretest and October 1971 Posttest Iowa Tests of Basic Skills Modern Mathematics Supplement	15
7	Comparison of Sixth Grade Vocabulary Means for Target and Non-Target Groups When Fourth Grade Vocabulary, Verbal and Nonverbal I.Q. and Student Mobility Were Controlled by Analysis of Covariance for Regression.	17
8	Comparison of Sixth Grade Reading Comprehension Means for Target and Non-Target Groups When Fourth Grade Comprehension, Verbal and Nonverbal I.Q. and Student Mobility Were Controlled by Analysis of Covariance for Regression.	18
9	Comparison of Sixth Grade Mathematics Means for the Target and Non-Target Groups When Fourth Grade Mathematics, Verbal and Nonverbal I.Q. and Mobility Were Controlled by Analysis of Covariance for Regression	19

(continued)

Listing of Tables (continued)

Table		Page
10	Target Area Vocabulary and Comprehension Grade Equivalent Gains Breakdown by Category.	20

Minneapolis Public Schools

AN ANALYSIS OF THE READING AND MATH GROWTH OF MINNEAPOLIS INTERMEDIATE GRADE TITLE I STUDENTS 1969-1971

Overview

The purpose of this study was to ascertain the reading and math progress made by Title I eligible intermediate grade students who resided in the Minneapolis Public Schools Target Area. A comparison group of students was also selected for study from the non-Target Area schools. These students would have been eligible to receive Title I programs had they resided in the Target Area.

In general, children who are eligible to receive Title I services (Title I eligibles) are those children who are determined to be functioning a year or more below grade level or at or below the 25th percentile in basic skills (reading, writing, mathematics, and oral language).

Progress of the Target and non-Target groups was studied for the period between January 1970 when they were fourth graders until October 1971 when they were in sixth grade. Excluding summers, these students would have been in attendance at school for 16 months during the study period.

The major Title I programs which were in operation in the Target Area for the intermediate grade students during the study period were: (1) Auxiliary Personnel Program, (2) Special Education Services, and (3) Basic Skills Centers.

The Auxiliary Personnel Title I program consisted of about 500 teacher aides who were assigned to Target Area schools only. The goal of the program was to assist teachers so that they could provide more individualized instruction for their pupils. In addition, aides provided direct tutorial help to Title I students.

Eighteen Title I special education teachers (1970-71) trained in special learning and behavior problems (SLBP) worked in Target Elementary Schools. SLBP teachers provided individual instruction for children with severe learning and behavior problems which retard academic progress but do not necessitate placement in special classes. SLBP teachers were assigned approximately 15 students and spent up to one hour a day with

each child or in small groups not exceeding three in number.

The Basic Skills Centers served approximately 700 Title I eligible students in grades 4 - 9 in the Target Area during 1970-71. There are two Centers which attempt to remediate severe reading deficiencies. Students are bussed to the Center daily where they receive extensive reading diagnosis and appropriate treatment.

These three programs were available to all Target schools during the time period covered by this study. No attempt was made in this study to determine the extent of student involvement in these programs.

There were several other Title I programs which helped Title I intermediate students in the Target Area. However, these programs were generally restricted to only one school. The programs were: (1) Individually Prescribed Instruction in math at Hall Elementary School, (2) Cassette Pilot Center at Clinton Elementary Schools, and (3) Concentrated Education Centers at Hay and Mann Elementary Schools.

In addition to these programs, Title I funds were used during the summer to conduct basic skills remediation programs for Title I students.

There were a number of other Title I programs in operation during this time period, however none of them would have had any real impact with the group of students who were studied. The Pyramids Reading Program, which is a major Title I reading program was aimed at K - 3 students during the time of this study, and thus should have had little impact on the reading abilities of the Target study group. It should also be emphasized that while this study examined math progress, there was only one math program in operation in one school (IPI program at Hall) during the time of this study.

The intermediate grades were selected for study because no recent study conducted at this level was longer than one year in length. Since Title I reading and math programs are being refined and expanded at this level, it is necessary to gather baseline data for future Title I program comparison and yardstick measurements. Since Educational Testing Service has been conducting a longitudinal study in the primary grades, it was decided that any study which was conducted at this level would be redundant. In addition, the intermediate grades were chosen for study because more reliable measures were available for that age group and a more consistent citywide testing program existed in these grades than in the primary grades.

Objectives

The following questions were studied:

1. What grade equivalent gains in vocabulary test scores were made by Title I Target students and a comparable group of non-Target students?

2. What grade equivalent gains in reading comprehension test scores were made by Title I Target students and a comparable group of non-Target students?

3. What grade equivalent gains in math test scores were made by Title I Target students and a comparable group of non-Target students?

4. Did Title I eligible students (Target) make significantly greater gains in reading and math test scores than a comparable group of students (non-Target) who had not participated in Title I programs?

The section which follows describes the population which was studied.

Population and Sampling Procedures

The population from which the samples were taken consisted of all 1969-70 fourth graders in the Minneapolis Public Schools who were tested in January 1970 and whose test scores were at or below the 25th percentile on publisher norms of the Gates-MacGinitie Reading Comprehension Test, Survey D, Form 1M.

Two samples were selected from the population. Sample one consisted of the Target Area student population and sample two consisted of the non-Target fourth grade student population. The Target Area student sample was selected in the following manner: In 1969-70 there were 20 elementary schools that received benefits from Title I programs. However, two of these schools, Adams and Corcoran, were not included in the study because no fourth grade test scores were available at Adams, and no math scores were available at Corcoran. The 18 Target Area elementary schools selected for the study are listed in Table 1. Table 1 also shows a sample breakdown for Target Area students by school.

From these 18 Target Area elementary schools, 468 students were identified as being at or below the 25th percentile in reading comprehension. This information was gathered from a list of the Gates-MacGinitie Reading

Table 1

Sample Breakdown for Target Area Fourth Grade Student Group by School

School	Total School 4th Grade Enrollment 1969-70	Number with 4th Grade Reading Comprehension Test Scores [1]	Number at or below 25th Percentile	Number in Sample
Bethune	74	74	34	11
Clinton	47	46	24	10
Greeley	83	81	32	12
Hall	57	53	26	9
Harrison	118	95	33	8
Hawthorne	85	81	23	5
Hay	97	94	48	14
Irving	79	65	25	4
Old Lyndale	116	118	39	8
Madison	20	20	4	1
Mann	130	133	54	15
Motley	5	5	2	1
Pratt	48	48	10	1
Seward	98	90	27	9
Sheridan	41	38	9	2
Webster	27	25	9	4
Whittier	74	67	20	2
Willard	133	134	49	10
Total	1332	1267	468	126

[1] In some instances the number of students with test scores is larger than the number of students enrolled. This is because the date the enrollment was taken and the date of testing were different.

Comprehension Test Scores for the Target Area fourth graders that was made available by the Guidance Services Department. From this list, using a table of random numbers, a 50 percent random sample of fourth grade students was selected from each school. However, because of the conditions listed below, only 126 of these 234 students were finally selected as the Target Area study group.

1. Students had to have complete test scores; that is, they had to have both fourth and sixth grade vocabulary, comprehension and math test scores, and verbal and nonverbal I.Q. scores.

2. Students had to attend a school within the Target Area during the period of time covered by the study. They could move from one school to another within the Target Area, but those who moved from the Target Area into a non-Target Area were dropped from the study. Table 1 lists the number of students from each Target Area school that were included in the study.

Thus, the final study sample consisted of 27 percent of all Title I eligible students in 18 of the 20 Title I schools. The sample is biased to the extent that high absentee students may be under represented. However, within this limitation, the sample appears reasonably representative of most Title I fourth graders in Minneapolis.

Table 2 on the next page provides the sample data for the non-Target Area student group. The non-Target Area was selected in the following manner: Twenty, or 42 percent, of the 48 elementary non-Target Area elementary schools were randomly selected. The school sample was obtained by assigning a number to each non-Target Area elementary school and then using a table of random numbers to pick the 20 schools. All fourth grade students whose Reading Comprehension Test scores were at or below the 25th percentile in these schools were selected for study and constituted the non-Target study group. The same conditions were imposed on this student sample group as on the Target group that is, each student was required to have complete pre- and posttest data, and each student had to attend school in the non-Target Area during the entire period of the study. Of the 233 students who had Comprehension Test scores that were at or below the 25th percentile, 154, or 66 percent, were included in the non-Target study group. This compares with 126 or 27 percent in the Target student group.

Table 2

Sample Breakdown for Non-Target Area
Fourth Grade Student Group by School

School	Total School 4th Grade Enrollment 1969-70	Number with 4th Grade Reading Comprehension Test Scores[1]	Number at or below 25th Percentile	Number in Sample
Armatage	93	91	4	1
Burroughs	116	115	6	2
Cooper	93	90	13	9
Field	83	82	34	24
Fuller	82	82	8	7
Fulton	121	120	13	7
Hale	88	89	9	3
Hiawatha	91	93	11	5
Howe	79	80	7	4
Keewaydin	62	62	8	6
Lind	82	78	5	4
Longfellow	97	95	26	18
Loring	57	52	6	1
Marcy	32	30	6	5
Northrop	52	55	5	3
Pillsbury	56	57	11	9
Putnam	60	55	15	6
Schiller	82	75	18	12
Waite Park	97	98	19	17
Windom	71	73	9	6
Total	1594	1572	233	154

[1] In some instances the number of students with test scores is larger than the number of students enrolled. This is because the date the enrollment was taken and the date of testing were different.

Table 3 presents a breakdown by sex of the Target and non-Target study group.

Table 3

Breakdown of Target and Non-Target Student Samples by Number of Male and Female Students

Sex	Target	Non-Target
Male	70	98
Female	56	56
Total	126	154

The section which follows describes the tests or instruments that were used to measure the reading and math achievement of the students in the two groups.

Achievement Tests and Other Measurements

In January 1970, both the Target and non-Target groups took the Gates-MacGinitie Survey D, Form 1M test in Reading Comprehension and Vocabulary. At the same time the students took the Modern Mathematics Supplement to the Iowa Tests of Basic Skills and the Lorge-Thorndike Verbal and Nonverbal Test, Level 3, Form A. In October 1971, the students again took Survey D, Form 1M of the Gates-MacGinitie Vocabulary and Comprehension Test. The Modern Math Test was also administered in October 1971 with the 6th grade form of the test given instead of the 4th grade form.

The Vocabulary Test samples the students' reading vocabulary. This test has 50 items, each consisting of a test word followed by five other words, one of which is similar in meaning to the test word. The students' task is to choose the word which is most nearly synonymous to the test word. The first items are composed of easy, commonly used words. Generally, the words become less common and more difficult as the test progresses.

The test is a "power" test and has a 15-minute time limit.

The Comprehension Test measures the students' ability to read complete prose passages with understanding. It contains 21 passages and 52 blank spaces, with each blank space having five possible completions. A student must decide which one of the five completions best conforms to the meaning of the whole passage. The first passages are simply written, but the later ones become progressively more difficult. The test is also a "power" test and has a 25-minute time limit.

The Modern Math Supplement Test for the fourth grade consists of 36 multiple choice items with four response alternatives. Two items deal with currency, four with equations, three with fractions, three with geometry, four with measurement, eight with numeration and twelve with whole numbers. The sixth grade portion of the Modern Math Supplement Test consists of 45 multiple choice items. Two items deal with decimals, five with equations, thirteen with fractions, six with geometry, one with measurement, nine with numeration, two with ratios, one with sets, and six with whole numbers. The test has a 30-minute time limit and is a "power" test.

The Lorge-Thorndike Intelligence Test is a group test which consists of a verbal battery with a 34-minute time limit and a nonverbal battery with a 27-minute time limit. The reusable form of the intelligence test was given to the students.

Since the tests are well known, the reader interested in more information about the validity and reliability of the tests should consult the test manual for each instrument.

These three tests, the Gates-MacGinitie, the Modern Math Supplement and the Lorge-Thorndike are part of the regular citywide testing program conducted by the Minneapolis Public Schools' Guidance Services Department. The testing was administered by the classroom teacher. The reading tests were scored by National Computer Systems of Minneapolis. The I.Q. tests were scored by Houghton Mifflin's scoring service.

Methodology

The test data for the Gates-MacGinitie Reading Comprehension and Vocabulary Test and the Modern Math Supplement Test were taken from the

Guidance Services Department records located at the Central Administration Office of the Minneapolis Public Schools. Since the Guidance Services Department does not collect I.Q. data, it was necessary to retrieve Lorge-Thorndike data from the cumulative records in the schools. Student mobility data also were obtained from the cumulative records.

For the purposes of this study, mobility was defined as the number of schools that a student had attended in Minneapolis through April 1972. For example, a student that moved from school A to B and back to A was defined as having made three moves, and was given a mobility index rating of three.

Test and mobility data were recorded so they could be sent directly to the Minneapolis Public School Data Processing Center for keypunching. After keypunching, a sort was made on all columns of the card to eliminate missing data items. The data were then listed on a computer printout sheet and examined for unreliable or invalid data.

The data were analyzed on the University of Minnesota Control Data Corporation 6600 computer. Two standard statistical packages were used to process the data. The first computer program package was the UMST600 Descriptive Statistics Program which prints means, standard deviations and variances. The second package was the UMST500 Correlation and Multiple Linear Regression Program. This program prints out the usual data required for doing multiple linear regression problems. The program provides correlation coefficients, multiple correlation coefficients, and regression coefficients.

The data for the first three objectives of the study were analyzed by the use of descriptive statistics. The data for the last question were analyzed by analysis of covariance using multiple linear regression. This procedure has been described in detail by Bottenberg and Ward (1963) and Williams (1972). The section which follows describes the procedure in more detail.

Methodology for Determining if There Was A Significant Difference Between Target and Non-Target Groups When Certain Variables Were Held Constant

One question of interest that educators often ask about Title I programs is: Did Title I youngsters who participated in Title I reading and math programs make significantly greater gains in reading and math

than a comparable group of students who had not participated in Title I programs?

In order to answer this question, it was necessary that any variable which might cause one group to have an initial or pre-program advantage over the other be controlled. Variables such as I.Q., mobility, and pre-test score could have influenced the results of the study if they had not been controlled.

Because it was not possible to entirely control these factors in the experimental design, analysis of covariance using a multiple linear regression approach was used to statistically control any differences that might have existed between the Target and non-Target groups on the variables mentioned.

In order to test for significant differences between the Target and non-Target group on the posttest achievement measures, the students' Verbal and Nonverbal Lorge-Thorndike Intelligence Test scores, the pre-test achievement test scores, and the students' mobility indices were statistically controlled.

To test the hypothesis of no difference between groups on a posttest measure using an analysis of covariance for regression, it was first necessary to construct a <u>full model</u> based on all the information desired to be entered into the regression. Thus, when vocabulary is used as the posttest measure, the full model is as follows.

$$y = b_o + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + b_6 x_6 + e$$

where:

y = Posttest score (6th grade vocabulary)

x_1 = Pretest score (4th grade vocabulary)

x_2 = Student mobility index

x_3 = Verbal Intelligence Score

x_4 = Nonverbal Intelligence Score

x_5 = Target Group (1 if the posttest score is from a member of the Target Group, 0 if otherwise)

x_6 = Non-Target Group (1 if the posttest score is from a member of the non-Target group, 0 if otherwise)

b_o = The Y intercept

$b_1 - b_6$ = The regression coefficients for $x_1 - x_6$

e_1 = The error in the prediction of the full model

The restricted model using only the covariates as predictor variables is as follows:

$$y = b_o + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + e_2$$

where:

y = Posttest score (6th grade vocabulary)

x_1 = Pretest score (4th grade vocabulary)

x_2 = Student mobility index

x_3 = Verbal Intelligence Score

x_4 = Nonverbal Intelligence Score

b_o = The Y intercept

$b_1 - b_4$ = The regression coefficients for $x_1 - x_4$

e_2 = The error in prediction with the restricted model

The F test for the analysis of covariance is given by:

$$F = \frac{(R^2_{FM} - R^2_{RM}) / (K - 1)}{(1 - R^2_{FM}) / (N - C - K)}$$

Where:

R^2_{FM} = The multiple correlation squared for the full model

R^2_{RM} = The multiple correlation squared for the restricted model

K = The number of groups

N = The number of subjects, and

C = The number of covariates

The section which follows uses the above stated method as a means of determining if there was a statistically significant difference (.05 level) between sixth grade Target and non-Target students on the posttest achievement scores when pretest 4th grade achievement scores, Verbal and Nonverbal I.Q., and student mobility index, were controlled.

Analysis of the Data

The data are presented in this section according to the order of the research questions presented earlier.

Since pretesting was done in mid-January 1970, and posttesting in mid-October 1971, an average student might expect to gain about 16 months in grade equivalent gains or have a grade equivalent score of 1.6.

Where raw scores have been converted to grade equivalent gains or percentiles, publisher's norms and tables have been used for the conversion.

Pre- and Posttest Vocabulary Score Comparison for the Target and Non-Target Student Groups

Table 4 presents data for pre- and posttest scores for the Target and non-Target Area student groups. The Gates-MacGinitie Survey D, Form 1M Vocabulary Test was taken by both groups on both the pre- and posttest measures.

Table 4

Mean Raw Scores, Raw Score Standard Deviation, Grade Equivalents, Publisher Percentiles and Gains for Target and Non-Target Students on January 1970 Pretest and October 1971 Posttest Gates-MacGinitie Vocabulary Test

Test	Target N=126			Non-Target N=154		
	Pretest	Posttest	Gain	Pretest	Posttest	Gain
Mean Raw Score	11.6	19.6	+ 8.0	14.0	23.1	+ 9.1
Raw Score Standard Deviation	5.8	6.4		6.0	7.0	
Grade Equivalent	2.9	4.0	+ 1.1	3.2	4.4	+ 1.2
Publisher's Percentile	7	14	+ 7	12	18	+ 6

The Target group mean raw score on the pretest was 11.6 for a grade equivalent score of 2.9. Compared to the publisher's national norms, the Target group scored at the 7th percentile on the pretest.

The non-Target group had a pretest mean raw score of 14.0 which placed them at the second month of the third grade in terms of grade equivalent scores. This would place them at the 12th percentile when compared with the national norm group who took the test.

When pre- and posttest gains are compared, it can be noted that the Target group improved its raw score by 8.0 points compared to 9.1 by the non-Target group. In terms of grade equivalent scores, the Target group made a growth of one year one month compared to one year two months for the non-Target group. An average student would make approximately 16 months' gain in grade equivalent scores.

Both groups improved their percentile standing when compared to the norm group. The Target group improved from the 7th percentile in the fourth grade to the 14th percentile in the sixth grade, and the non-Target group improved from the 12th percentile to the 18th percentile

Pre- and Posttest Reading Comprehension Score Comparison for the Target and Non-Target Student Groups

Table 5 presents the results for the pre- and posttest Reading Comprehension scores. The Gates-MacGinitie Survey D, Form 1M, Reading Comprehension Test was taken by both groups on pre- and posttest measures.

Table 5

Mean Raw Scores, Raw Score Standard Deviation, Grade Equivalents, Publisher Percentiles and Gains for Target and Non-Target Students on January 1970 Pretest and October 1971 Posttest Gates-MacGinitie Comprehension Test

Test	Target N=126 Pretest	Posttest	Gain	Non-Target N=154 Pretest	Posttest	Gain
Mean Raw Score	9.4	19.3	+ 9.9	10.0	22.8	+ 12.8
Raw Score Standard Deviation	3.4	8.0		3.1	9.2	
Grade Equivalent	2.4	3.5	+ 1.1	2.5	4.0	+ 1.5
Publisher's Percentile	5.	12.	+ 7.	7.	16.	+ 9.

The Target group mean raw score on the pretest Comprehension Test was 9.4. This score has a grade equivalent of 3.4 and placed the group at the fifth percentile when compared with the publisher's norms.

The non-Target group had a pretest mean raw score of 10.0 which placed them at the fifth month of the second grade in terms of grade equivalent scores. The group's raw scores placed them at the seventh percentile on the publisher's norms.

When pre- and posttest gains were taken into consideration, Target students improved 9.9 raw score points compared to 12.8 for the non-Target students. In terms of grade equivalent gains, the Target group went from a grade equivalent pretest score of 2.4 to 3.5 on the posttest for a gain of 1.1. The non-Target group of students made a grade equivalent gain of 1.5. Thus, the non-Target students made four months more gain than the Target group.

Table 5 also indicates that the Target group improved its percentile standing from the 5th percentile to the 12th percentile. The non-Target group also improved its standing, when compared to the norm group, from the 7th to the 16th percentile. Thus, both groups improved, but still they were far behind the average of the publisher's norm group.

Pre- and Posttest Mathematics Score Comparison for the Target and Non-Target Student Groups

Table 6 presents the results for the pre- and posttest mathematics scores. The Iowa Tests of Basic Skills Modern Mathematics Supplement, Multi-Level Edition for grades 3 - 8/9 was taken by both groups on the pre- and posttest. It should be noted that the fourth grade test is different from the sixth grade test.

The Target and non-Target groups had almost identical scores on the pretest. The Target group had a mean raw score of 9.6 and the non-Target group had a mean raw score of 9.7. Both raw scores had a grade equivalent of 3.0. Both groups were at the 6th percentile when compared to the publisher's norms for 4th graders.

Table 6

Mean Raw Scores, Raw Score Standard Deviation, Grade Equivalents, and Publisher Percentiles, for Target and Non-Target Students on January 1970 Pretest and October 1971 Posttest Iowa Tests of Basic Skills Modern Mathematics Supplement

Test	Target N=126		Non-Target N=154	
	Pretest	Posttest	Pretest	Posttest
Mean Raw Score	9.6	10.2	9.7	12.4
Raw Score Standard Deviation	4.3	4.5	4.2	5.9
Grade Equivalent	3.0	4.4	3.0	4.8
Publisher's Percentile	6.	10.	6.	18.

The posttest scores for the Target and non-Target groups were as follows: The Target group had a mean raw score of 10.2 and a grade equivalent score of 4.4. When the Target group posttest mean score was compared with the 6th grade norm group, the Target group was at the 10th percentile. The non-Target group's mean raw score on the posttest was 12.4. This score placed the group at the 18th percentile when compared to

publisher's norms. The raw score had a grade equivalent of 4.8. Thus, the non-Target group did somewhat better on the posttest than the Target group.

The section which follows has attempted to examine the question of whether or not there were statistically significant differences in posttest scores between the two groups when pretest differences, Verbal and Nonverbal Intelligence Test scores, and the students' mobility indices were controlled.

Sixth Grade Achievement Test Score Comparison
Between Target and Non-Target Students

An analysis of covariance for regression was done with the sixth grade Vocabulary Test scores as the criteria for the Target and non-Target groups. The variables which were controlled by the analysis of covariance for the regression were:

1. Pretest fourth grade Vocabulary Test scores
2. The Lorge-Thorndike Intelligence Test Verbal Test Score
3. The Lorge-Thorndike Intelligence Test Nonverbal Test Score
4. The mobility index for each student.

Table 7 presents the data for comparison between Target and non-Target student groups on the sixth grade Vocabulary Test score.

Table 7 indicates that non-Target students performed significantly better (.05 level) than Target students when sixth grade vocabulary test scores were used as the criterion. This was true when the two groups pretest score (fourth grade vocabulary), Verbal and Nonverbal I.Q., and the student mobility index were statistically controlled.

Table 7

Comparison of Sixth Grade Vocabulary Means for Target and Non-Target Groups When Fourth Grade Vocabulary, Verbal and Nonverbal I.Q. and Student Mobility Were Controlled by Analysis of Covariance for Regression

Criterion and Covariates	Target N=126		Non-Target N=154		R^2_{FM}	R^2_{RM}	F-Ratio
	Mean Raw Score	Standard Deviation	Mean Raw Score	Standard Deviation			
A. Criterion							
1. 6th Grade Vocabulary	19.6	6.4	23.1	7.0			
2. 6th Grade Vocabulary Adjusted	20.4		22.3		.42400	.41105	6.14*
B. Covariates							
1. 4th Grade Vocabulary	11.6	5.8	14.0	6.0			
2. Verbal I.Q.	25.4	9.8	28.8	11.9			
3. Nonverbal I.Q.	32.9	11.4	35.9	12.9			
4. Student Mobility	2.7	2.0	1.6	1.0			

*$F_{.05}(1,274) = 3.80$ The F- Ratio is significant beyond the .05 level.

Table 8 reports the results for the comparison between Target and non-Target groups when sixth grade Comprehension Test scores were used as the criteria.

Table 8 indicates that there were no significant differences (.05 level) between Target and non-Target groups when sixth grade Reading Comprehension scores were used as the criteria. This is true when the two groups pretest

Table 8

Comparison of Sixth Grade Reading Comprehension Means for Target and Non-Target Groups When Fourth Grade Comprehension, Verbal and Nonverbal I.Q. and Student Mobility Were Controlled by Analysis of Covariance for Regression

Criterion and Covariates	Target N=126		Non-Target N=154		R^2_{FM}	R^2_{RM}	F-Ratio
	Mean Raw Score	Standard Deviation	Mean Raw Score	Standard Deviation			
A. Criterion							
1. 6th Grade Comprehension	19.3	8.0	22.8	9.2			
2. 6th Grade Comprehension Adjusted	20.3		21.9		.36884	.36185	3.04*
B. Covariates							
1. 4th Grade Comprehension	9.4	3.4	10.0	3.1			
2. Verbal I.Q.	25.4	9.8	28.8	11.9			
3. Nonverbal I.Q.	32.9	11.4	35.9	12.9			
4. Student Mobility	2.7	2.0	1.6	1.0			

*$F_{.05}$ (1,274) = 3.80 The F- Ratio is not significant at the .05 level.

*$F_{.10}$ (1,274) = 2.75 The F- Ratio was significant at the .10 level.

score (fourth grade reading comprehension score), Verbal and Nonverbal I.Q., and the student mobility index were statistically controlled. It should be noted, however, that if the .10 level of significance was used, the criterion mean difference between Target and non-Target students would have been significant and would have favored the non-Target student group.

Table 9 reports the results for the comparison between Target and non-Target student groups when the sixth grade Modern Mathematics Test scores were used as the criteria.

Table 9

Comparison of Sixth Grade Mathematics Means for the Target and Non-Target Groups When Fourth Grade Mathematics, Verbal and Nonverbal I.Q. and Mobility Were Controlled by Analysis of Covariance for Regression

Criterion and Covariates	Target N=126 Mean Raw Score	Target N=126 Standard Deviation	Non-Target N=154 Mean Raw Score	Non-Target N=154 Standard Deviation	R^2_{FM}	R^2_{RM}	F-Ratio
A. Criterion							
1. 6th Grade Math	10.2	4.5	12.4	5.9			
2. 6th Grade Math Adjusted	10.7		12.1		.30835	.29515	5.24*
B. Covariates							
1. 4th Grade Math	9.6	4.3	9.7	4.2			
2. Verbal I.Q.	25.4	9.8	28.8	11.9			
3. Nonverbal I.Q.	32.9	11.4	35.9	12.9			
4. Student Mobility	2.7	2.0	1.6	1.0			

*$F_{.05}$ (1,274) = 3.80 The F-Ratio is significant beyond the .05 level.

Table 9 indicates that non-Target students peformed better (.05 level) than Target students when the sixth grade Iowa Tests of Basic Skills Modern Math scores were used as the criteria and when the two groups pretest score (fourth grade Modern Math Test score), Verbal and Nonverbal I.Q. and the student mobility index were statistically controlled.

This analysis has shown that low achieving students in Target and non-Target schools improved their standing relative to the publisher's normative samples between January 1970 and October 1971 in vocabulary, comprehension and mathematics. Non-Target students were shown to have made significantly greater gains than Target students in these areas when initial test differences, mobility and I.Q. were statistically controlled.

The next section presents a frequency table for the grade equivalent gains made by Target Area students in vocabulary and comprehension.

Target Area Student Grade Equivalent Gains in Vocabulary and Comprehension by Category

Table 10 presents the grade equivalent gains for the Target Area students in reading comprehension and vocabulary.

Table 10

Target Area Vocabulary and Comprehension Grade Equivalent Gains Breakdown by Category

Grade Equivalent Gain	Vocabulary		Comprehension	
	N	% of Total N	N	% of Total N
1.6+	38	30%	42	33%
1.0 - 1.5	33	26	23	18
.6 - .9	16	13	20	16
.1 - .5	24	19	27	21
No gain or regressed	15	12	14	11
Total	126	100	126	99[1]

[1]Total does not equal 100 because of rounding.

Table 10 indicates that 30 percent of the Target Area students made grade equivalent gains of 1.6 or better in vocabulary. In comprehension, 33 percent made 1.6 or better gains. An average student, when compared to the publisher's norms, could expect to make a gain of 1.6 over the same pre- and posttest period.

Fifty-six percent of the students made vocabulary gains of one year or more and 51 percent had comprehension gains of 1.0 or better. Thirty-one and 32 percent of the students made gains of less than six months in vocabulary and comprehension respectively. The next section summarizes the report and discusses its implication.

Summary and Discussion

The major purpose of this study was to ascertain the reading and math progress made by Title I eligible intermediate grade students who resided and attended school in the Minneapolis Public Schools Target Area. A comparison group of students was also selected for study from the non-Target schools.

The students involved in this study were tested in reading and math in January 1970, when they were fourth graders, and in October 1971 after they had entered sixth grade.

The following questions were studied:

1. What grade equivalent gains in vocabulary test scores were made by Title I Target students and a comparable group of non-Target students?

2. What grade equivalents gains in reading comprehension test scores were made by Title I Target students and a comparable group of non-Target students?

3. What grade equivalent gains in math scores were made by Title I Target students and a comparable group of non-Target students?

4. Did Title I eligible students (Target) make significantly greater gains in reading and math test scores than a comparable group of students (non-Target) who had not participated in Title I programs?

The population from which the Target and non-Target student groups were selected consisted of all 1969-70 fourth graders in the Minneapolis Public Schools whose test scores were at or below the 25th percentile on publisher norms of the Gates-MacGinitie Reading Comprehension Test, Survey D, Form 1M.

The fourth grade Target Area student group was selected from the 18 Target Area elementary schools listed in Table 1 on page 4 . There were 468 Target Area students who were at or below the 25th percentile. From this group a 50 percent random sample was selected. However, because of incomplete test score information and movement from the Target Area, 126 students or 26 percent of the eligible Title I fourth graders were ultimately selected for study.

The non-Target Area student group was selected as follows: First, 20 of the 48 non-Target Area elementary schools were randomly selected. All

fourth graders in these schools who were at or below the 25th percentile were selected for inclusion in the study. One hundred fifty-four, or 66 percent of the 233 students who had test scores at or below the 25th percentile had complete data and were retained in the study.

In January 1970 and October 1971, both Target and non-Target student groups took the same form of the Vocabulary and Comprehension Gates-MacGinitie, Survey D, Form 1M Test. At the same time, both groups took the Modern Mathematics Supplement to the Iowa Tests of Basic Skills. The tests are part of the citywide testing program used in all Minneapolis elementary schools.

Results of the Vocabulary, Comprehension, and Math Tests for Title I Target Area and non-Target students are reported below. An average student on the publisher's norms would make a grade equivalent gain of about 1.6 over the same pre- and posttest period.

The results of the Vocabulary Test show that Title I Target Area students made an average grade equivalent gain of 1.1 compared to 1.2 for the non-Target student sample. An average Minneapolis student made a 1.6 grade equivalent gain over the same time period. The Target group went from a grade equivalent of 2.9 on the pretest to 4.0 on the posttest and the non-Target from 3.2 to 4.4. Thirty percent of the Target group made gains of 1.6 or better and 56 percent gained a year or more. Compared to the publisher's norms, the Target student group ranked at the 7th percentile on the pretest and the 14th percentile on the posttest. The non-Target group ranked at the 12th percentile on the pretest and the 18th percentile on posttest.

Thus, although Target and non-Target students did not score as high as the "average" child included in the publisher's norms, they did appear to have made greater relative gains than they had made previously.

A major concern of this study was whether Title I eligible Target students did better on achievement tests than a comparable group of non-Target students. In analyzing the posttest scores, the pretest score, verbal and nonverbal I.Q., and the students' mobility were statistically controlled by analysis of covariance for regression.

The results of the analysis of covariance for regression indicated that the non-Target group had a posttest adjusted mean on the Vocabulary Test of 22.3 and the Target group had a posttest adjusted mean of 20.4. The difference was significant beyond the .05 level in favor of the non-Target group.

When the two groups of students were compared on the Comprehension Test, both made reasonable gains. The Target student group went from a grade equivalent score of 2.4 on the pretest to 3.5 on the posttest for a gain of 1.1. The non-Target group made a gain of 1.5 from a pretest score of 2.5 to 4.0. The average Minneapolis student over the same time period made a gain of 1.7. Thirty-three percent of the Target students made gains of 1.6 or better and 51 percent made a year or more growth. Compared to publisher's norms, the Target student group ranked at the 5th percentile on the pretest and the 12th percentile on the posttest. The non-Target group ranked at the 7th percentile on the pretest and the 16th percentile on the posttest.

When the two groups' posttest adjusted means on the Comprehension Test were analyzed, it was found that there were no significant differences between the two groups. The adjusted mean for the Target group was 20.3 and the non-Target group was 21.9. However, if the .10 level of significance was used, there would have been a significant difference in favor of the non-Target group.

When the Target and non-Target groups of students were compared on the Math Test, both made reasonable progress. Because the pretest and posttest were different levels and forms, caution should be used when interpreting the results of the math test. The Target group ranked at the 6th percentile on the pretest and had a grade equivalent score of 3.0. On the posttest, the group ranked at the 10th percentile and had a grade score of 4.4. An average Minneapolis student had a grade equivalent score of 3.5 on the pretest and 5.6 on the posttest. The non-Target group had a percentile standing of 6 on the pretest and 18 on the posttest. Grade equivalents were 3.0 and 4.8 respectively.

When the posttest adjusted means for the two groups math scores were analyzed, a significant difference at the .05 level was found that favored the non-Target group. The non-Target adjusted mean was 12.1 and the Target adjusted mean was 10.7.

Discussion

If success of Title I programs can be judged on the basis of gains made in vocabulary, comprehension and math, then it can be said that Minneapolis Title I programs are a success since Title I students made grade equivalent gains of 1.1 in both vocabulary and comprehension. Certainly these gains are indicative of progress and should reflect favorably on Title I programs. While the gains weren't as much as the citywide gains or the publisher's norms, one wonders whether it is reasonable to expect as much gain as average youngsters who don't have the severe reading problems that Title I students have.

If one judges success of Title I programs by comparing Title I students' progress with similarly educationally disadvantaged youngsters who have not received Title I program benefits, then another kind of success measure can be obtained. This study has shown that Target Area Title I students don't do quite as well as non-Target students who normally would be eligible for Title I benefits but who are not because they reside and attend schools outside the Target Area.

While an attempt was made to control key variables such as pretest scores, I. Q. and mobility which might unduly bias tests results toward one group, no attempt either statistically or experimentally was made to determine or control the extent of bias in the two samples for differences in family socio-economic status, differences in student attendance, peer influence and other influences such as student motivation and attitude.

Assuming that much greater emphasis and program help were being placed in the Target Area in reading, why didn't the Target group do better than the non-Target group? One possible reason is that educationally disadvantaged children who are placed in higher income schools tend to improve at least as well as, and probably better than, educationally disadvantaged children who must live in Target Areas. For example, students at a particular non-Target school who might be considered educationally disadvantaged, probably get substantially greater individual attention than they would at a Target school simply because there are so few of them in the school with the type of difficulty which defines educationally disadvantaged whereas at certain Target schools the numbers are overwhelming. In the non-Target schools,

the peers of the disadvantaged children may provide much greater support than could be provided by the peers at Target schools simply because the peers at the Target schools have the same problems as the Target children. It can be argued that if we took a small number of low income family children and placed them into more favorable economic circumstances at different schools, that the influence of their peers and the educational program there, plus possibly greater individual attention focused on them because of their disability would indeed bring about substantial progress. In essence, this argument supports economic integration. Further detailed studies comparing schools with varying degrees of economic integration might provide data as to the point at which the proportions of economic and educationally disadvantaged children begins to work against realization of potential growth.

Another reason for the differences between Target and non-Target schools could be that the non-Target schools are more easily managed and that teachers have a less demanding and variable environment in which to teach. Thus, schools can be more efficient, teachers can meet the less serious needs of more students, and students can learn more and more easily. Basically, less time needs to be devoted to discipline and social problems of students and more time can be devoted to teaching and helping students.

Another possible reason why Title I Target students didn't surpass the non-Target student group is that the bulk of the Title I program emphasis has been focused on grades 1 - 3 and not on grades 4 - 6 where this analysis has been directed. In addition, most of the Title I efforts have been in reading and not in math.

In summary, Target Area Title I eligible students made progress in reading and math. In the 1972-1973 school year much greater emphasis and program support for reading and math programs will be made in the intermediate grade levels. This study also confirms earlier indications which led to the refinement of the Title I reading and math programs at the intermediate and junior high levels for the 1972-73 school year as well as the need for greater emphasis on earlier intervention in reading and math at the primary level.

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